CLAIMS

What is claimed is:

1. A method of coordinating transmission of data between a plurality of end nodes and a system head end comprising:

receiving at each of the end nodes a timing signal from a prior transmitting end node, the timing signal being reflected to each of the end nodes; and

transmitting upstream data to the system head end by one of the end nodes in response to receipt of the timing signal.

2. The method as claimed in claim 1 further comprising transmitting a second timing signal by the one end node after transmitting the upstream data.

3. The method as claimed in claim 2 wherein the upstream data is transmitted to the system head end on a first optical wavelength, the timing signal is received by the end nodes on a second optical wavelength, and a wavelength selective reflective element passes the first optical wavelength and reflects the second optical wavelength to each of the end nodes through a splitter/combiner element.

4. The method as claimed in claim 3 further comprising:

receiving, from the system head end, a transmission sequence indicating an order for transmission of the upstream data for the end nodes; and

tracking timing signals to determine when an end node is scheduled time to transmit the upstream data; and

transmitting the upstream data on the first wavelength in response to receipt of a number of timing signals corresponding with the order.

5. The method as claimed in claim 4 wherein the transmission sequence is received on a third optical wavelength, and wherein the wavelength selective reflective element also passes the third optical wavelength.

6. The method as claimed in claim 5 wherein the upstream data is conveyed on the first optical wavelength and downstream data is conveyed on the third optical wavelength, and

wherein an ultimate destination of the upstream data includes one of the end nodes of the plurality.

7. The method as claimed in claim 5 further comprising receiving a synchronization pulse from the system head end subsequent to the receiving the transmission sequence, the synchronization pulse indicating to the end nodes when to start the transmission sequence.

8. The method as claimed in claim 5 further comprising:

receiving, at a first of the end nodes, downstream data on the third optical wavelength at a primary transceiver;

receiving, at the first of the end nodes, timing signals on the second optical wavelength at a timing transceiver;

blocking, at the first of the end nodes, the timing signals on the second optical wavelength at the primary transceiver,

transmitting a timing signal by the timing transceiver on the second optical wavelength prior to the primary transceiver completing transmission of the upstream data on the first optical wavelength.

9. An end node of an optical system comprising:

a primary transceiver to transmit upstream data on a first optical wavelength;

a timing transceiver to receive timing signals on a second optical wavelength; and

a controller to track the received timing signals to determine a time for transmission of the upstream data,

wherein the timing signals are sent by end nodes of a plurality of end nodes responsive to transmission of upstream data, and wherein the timing signals are reflected by a wavelength selective reflective element to each of the end nodes.

10. The end node as claimed in claim 9 wherein the primary transceiver receives downstream data on a third optical wavelength, and wherein the timing transceiver transmits the timing signal prior to completion of the primary transceiver transmission of upstream data.

11. The end node as claimed in claim 10 wherein the end node is one of a plurality of end nodes, and wherein the primary transceiver receives a transmission sequence, the transmission sequence indicating a transmission order for transmitting the upstream data for each of the plurality of end nodes, the controller determining a transmission time for the end node based on tracking the received timing signals,

and wherein the timing transceiver transmits a timing signal on the second optical wavelength responsive to transmission of the upstream data by the primary transceiver on the first optical wavelength.

12. The end node as claimed in claim 11 further comprising a wavelength selective filter coupled to the primary transceiver to pass the first and third optical wavelengths and inhibit passage of the second optical wavelength, and wherein the transmission sequence is received by the primary transceiver on the third optical wavelength.

13. The end node as claimed in claim 12 wherein the wavelength selective reflective element is part of an outside plant node coupled to a system head end by a distribution fiber,

wherein the timing signals are reflected by the wavelength selective reflective element to each of the end nodes through a splitter/combiner element coupled to each end node by a drop fiber, the splitter/combiner element being part of the outside plant node, and

wherein the system head end provides the transmission sequence to the outside plant node for distribution to each end node, and

the splitter/combiner element combines upstream data received by the end nodes.

14. An optical network comprising:

a distribution fiber to convey upstream data to a system head end;

an outside plant node to receive downstream data from the distribution fiber; and

a plurality of drop fibers to couple end nodes with the outside plant node,

each end node to transmit a timing signal responsive to transmission of upstream data, the outside plant node to reflect the timing signal to each of the end nodes, each end node to track received timing signals and transmit upstream data in accordance with a transmission sequence.

15. The optical network as claimed in claim 14 wherein the transmission sequence is conveyed by the system head end system to each of the end nodes, the transmission sequence indicating an order for each of the end nodes to transmit upstream data, wherein each end node tracks received timing signals to determine when to transmit upstream data in accordance with the transmission sequence.

16. The optical network as claimed in claim 15 wherein the outside plant node comprises:

an optical splitter/combiner element coupled to each of the drop fibers; and

a wavelength selective reflective element coupled between the distribution fiber and the optical splitter/combiner element, the wavelength selective reflective element reflects the timing signals back to the optical splitter/combiner element.

17. The optical network as claimed in claim 16 wherein upstream data is on a first optical wavelength, the timing signals are on a second optical wavelength, and the downstream data is on a third optical wavelength, and

wherein the wavelength selective reflective element is comprised of a Bragg grating to reflect the timing signals, to pass the upstream data from the optical splitter/combiner element to the distribution fiber and to pass the downstream data from the distribution fiber to the optical splitter/combiner element.

18. The optical network as claimed in claim 17 wherein the distribution fiber is at least two times longer than a predetermined percentage of the drop fibers.

19. A method of transmitting data from a plurality of end nodes through an optical network comprising:

receiving upstream data from a first of the end nodes;

reflecting a timing signal to each of the end nodes by a wavelength selective reflective element; and

receiving upstream data from a next of the end nodes, the next end node transmitting the upstream data in response to receipt of the timing signal.

20. The method as claimed in claim 19 wherein data received from the first of the end nodes is transmitted to a system head end on a first optical wavelength,

wherein the timing signal is transmitted by the first of the end nodes on a second optical wavelength,

and wherein the wavelength selective reflective element reflects the second optical wavelength and passes the first optical wavelength.

21. The method as claimed in claim 20 further comprising providing a transmission sequence from the system head end to each of the end nodes, the transmission sequence comprising a sequence for the end nodes to transmit upstream data, wherein a next of the end nodes in the sequence transmit data in response to a timing signal received from a preceding one of the end nodes in the sequence.

22. The method as claimed in claim 21 wherein the end nodes track timing signals reflected by the wavelength selective reflective element to determine when each of the end nodes is scheduled to transmit upstream data.

23. The method as claimed in claim 20 wherein the wavelength selective reflective element is comprised of a Bragg grating.

24. The method as claimed in claim 22 further comprising transmitting the transmission sequence on a third optical wavelength, and wherein the wavelength selective reflective element passes the optical third wavelength.

25. The method as claimed in claim 20 further comprising splitting downstream data provided from the system head end among each end node of the plurality with a splitter/combiner element, the downstream data being on a third optical wavelength,

and wherein the wavelength selective reflective element to pass the downstream data on the third optical wavelength.

26. The method as claimed in claim 25 further comprising combining the upstream data with the splitter/combiner element, the upstream data transmitted by the end nodes on the first optical wavelength, the wavelength selective reflective element to pass the upstream data on the first optical wavelength.

27. The method as claimed in claim 25 wherein the wavelength selective reflective element couples a distribution fiber with a splitter/combiner element, the method further comprising:

conveying the upstream and downstream data between the system head end and the wavelength selective reflective element through a distribution fiber; and

conveying the upstream and downstream between the splitter/combiner element and each end node with at least one drop fiber,

wherein the distribution fiber has a length that is at least two times as long as a length of one of the drop fibers.

28. An outside plant node comprising:

a wavelength selective reflective element to pass upstream data on a first optical wavelength to a system head end, to reflect timing signals of a second optical wavelength, and to pass downstream data on a third optical wavelength; and

a splitter/combiner element to provide the downstream data from the wavelength selective reflective element to each of the plurality of end nodes, and to provide the upstream data and the timing signals received from the end nodes to the wavelength selective reflective element,

wherein the splitter/combiner element provides reflected timing signals from the wavelength selective reflective element to each of the end nodes, and wherein the end nodes track the reflected timing signals to determine when to transmit the upstream data, each end node transmitting a timing signal responsive to transmission of the upstream data.

29. The outside plant node as claimed in claim 28 wherein a distribution fiber is coupled between the wavelength selective reflective element and the system head end, and at least one of a plurality of drop fibers couple the splitter/combiner element with each end node of the plurality, the distribution fiber having a length at least two times as long as a length of one of the drop fibers.

30. The outside plant node as claimed in claim 29 wherein the wavelength selective reflective element comprises a Bragg grating and the splitter/combiner element comprises an optical coupler.